Electronic Supplementary Information (ESI) for

Porous CoP concave polyhedron electrocatalysts synthesized from metal-organic frameworks with enhanced electrochemical properties for hydrogen evolution

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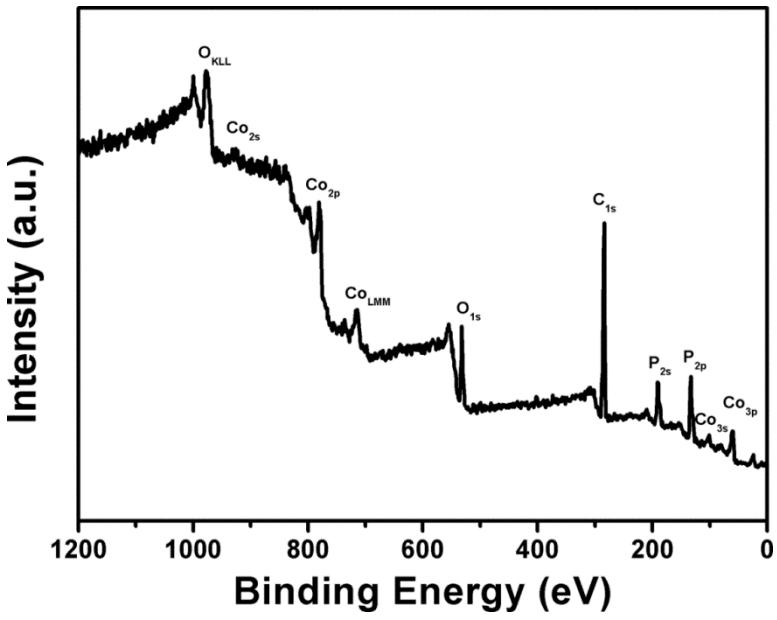

Fig. S1 XPS survey spectrum of the porous CoP CPHs.

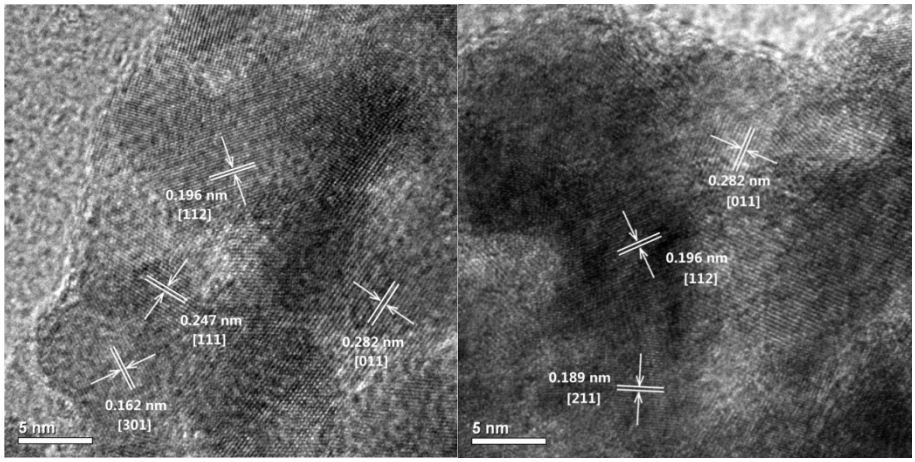

Fig. S2 HRTEM images of the porous CoP CPHs.

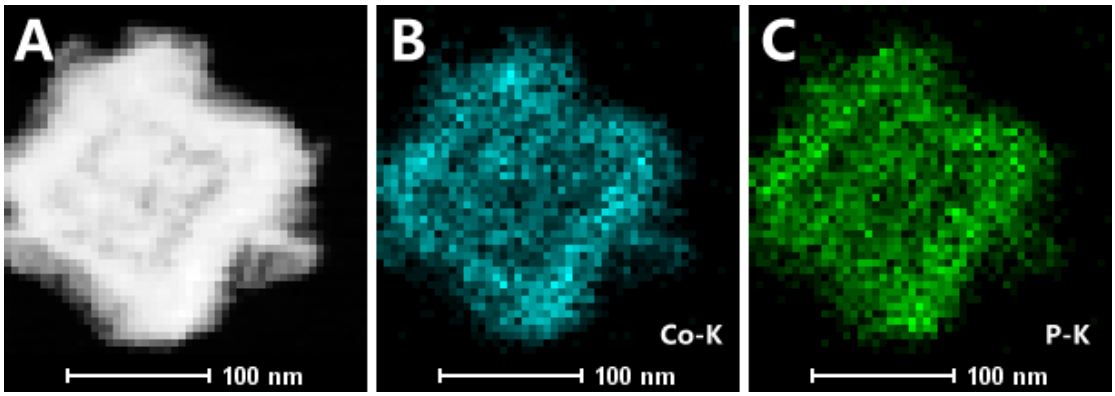

Fig. S3 HAADF-STEM (A) and elemental mapping images (B, C) of the as-prepared porous CoP CPHs.

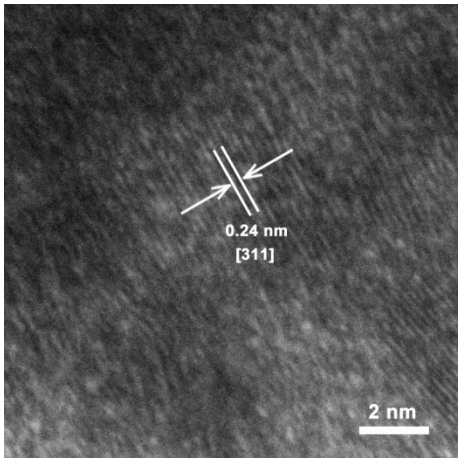

Fig. S4 HRTEM image of the porous Co_3O_4 CPHs.

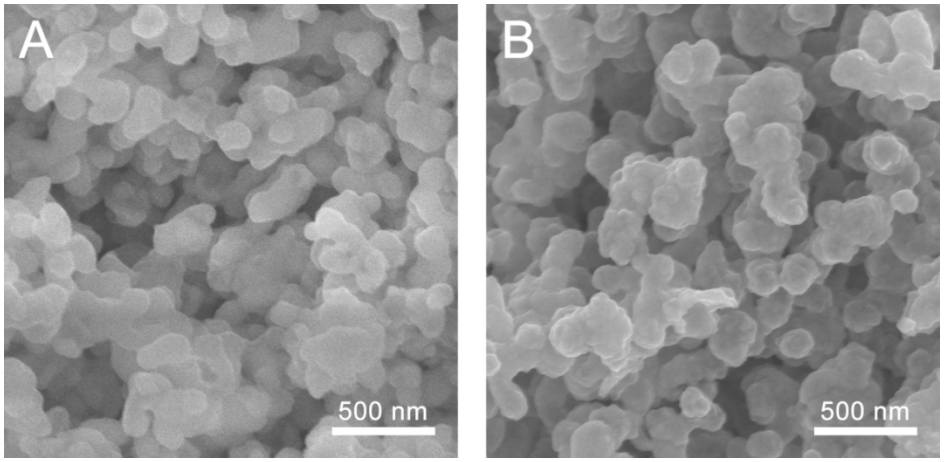

Fig. S5 SEM images of the contrastive (A) Co_3O_4 and (B) CoP NPs.

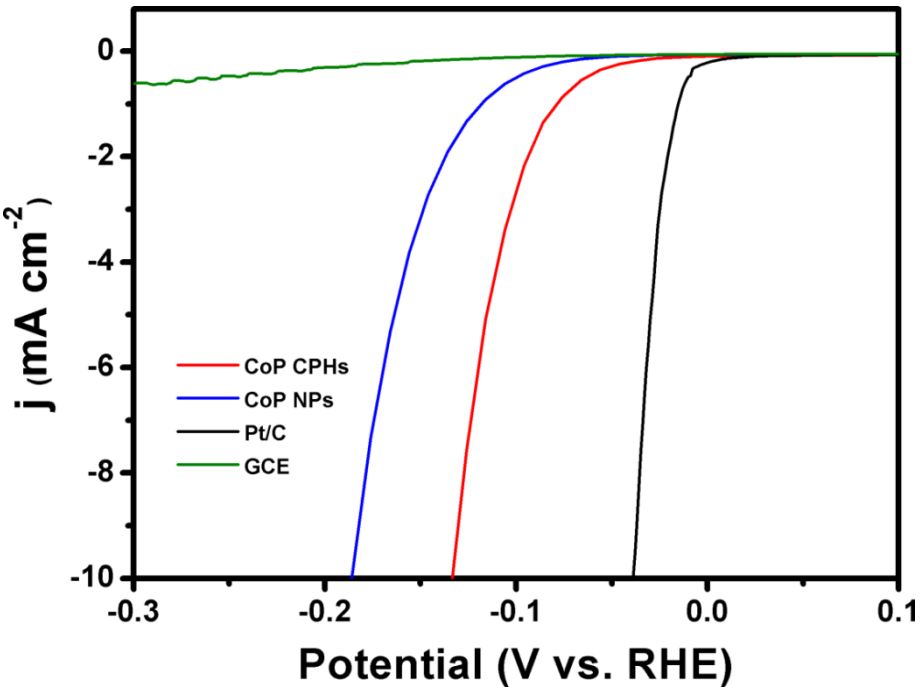

Fig. S6 Enlargement of polarization curves of bare GCE, Pt/C, CoP NPs and the porous CoP CPHs in 0.5 M H_2SO_4 at the scan rate of 2 mV s^{-1}.

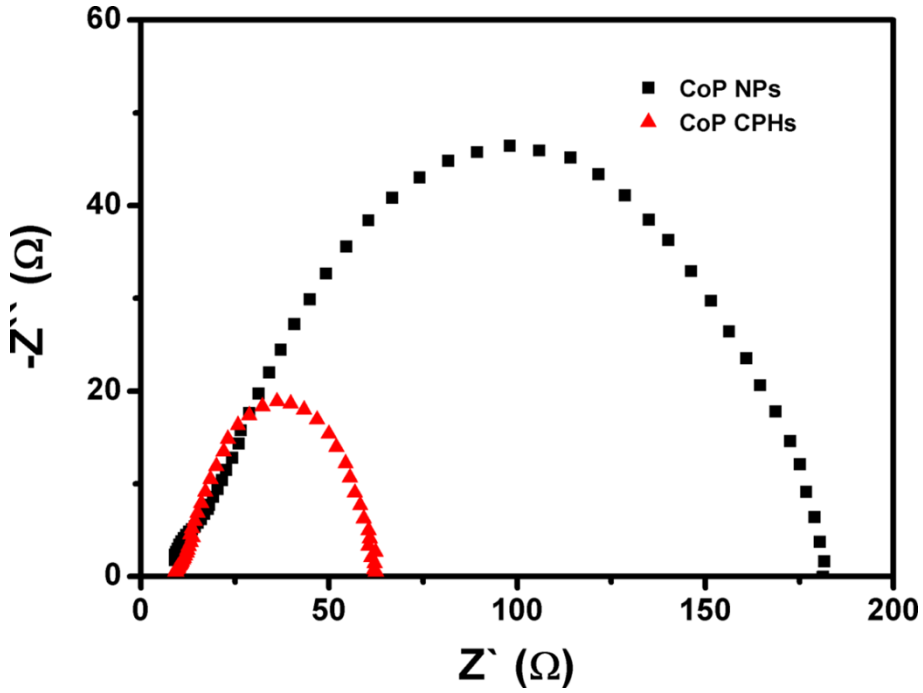

Fig. S7 Nyquist plots of electrochemical impedance spectra of CoP NPs (a) and the porous CoP CPHs (b) in 0.5 M H_2SO_4 at η = 200 mV.

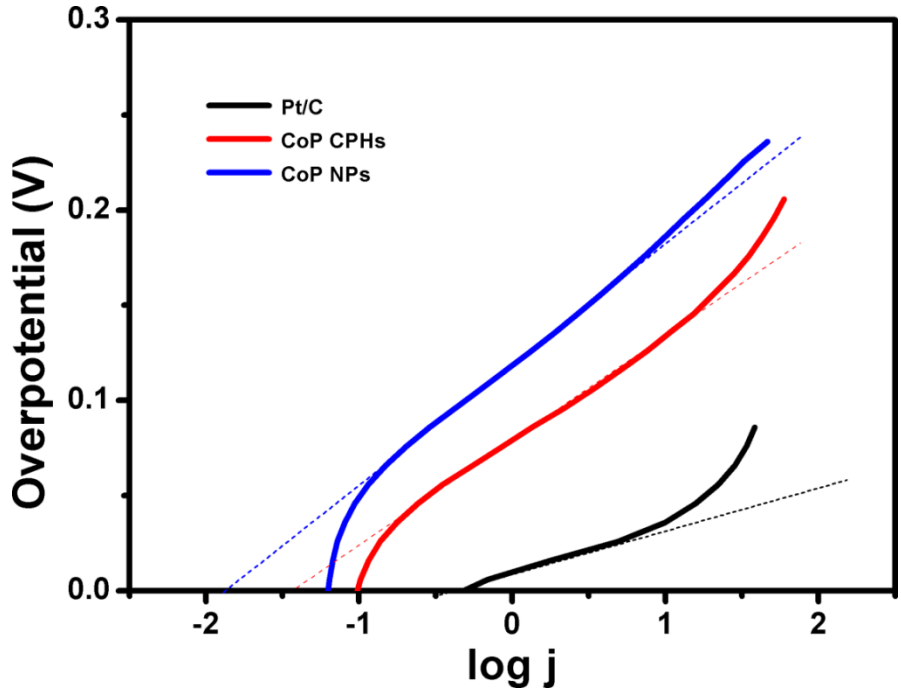

Fig. S8 Calculation of exchange current density of Pt/C, CoP NPs and the porous CoP CPHs.

Table S1 Comparison of various HER elecatalysts.

Catalyst	η_{10} (mV vs. RHE)[a]	Tafel slope (mV/dec)	j_0 (mA cm^{-2})[b]	Ref.
CoP microspheres	226	76	1.9×10^{-2}	20
Porous FeP nanosheets	~240	67		11
MoP	135	54	3.4×10^{-2}	42
Ni_2P nanoparticles	~225	86		43
Amorphous WP nanoparticles	120			44
Bulk WP	~200			44
Cu_3P nanowire/CF	143	67	1.8×10^{-1}	14
Cu_3P microparticle/CF	~200	96	4.0×10^{-2}	14
Ni_2P nanorods/GC	~280	115	5.1×10^{-5}	45
Co_2P nanorods/GC	~150	53	1.7×10^{-5}	45
WS_2 nanoribbons	225	68	$\sim 1.0 \times 10^{-2}$	40
Defect-rich MoS_2 nanosheets	~190	50	8.91×10^{-3}	41
Bulk Mo_2C	208	56	1.3×10^{-3}	46
Bulk MoB	212	55	1.4×10^{-3}	46
MoN/C		54.5	3.6×10^{-2}	47
$NiMoN_x$/C		35.9	2.4×10^{-1}	47
CoP CPHs	133	51	4.4×10^{-2}	Our work

[a] the overpotential where the current density is 10 mA cm^{-2}

[b] the exchange current density

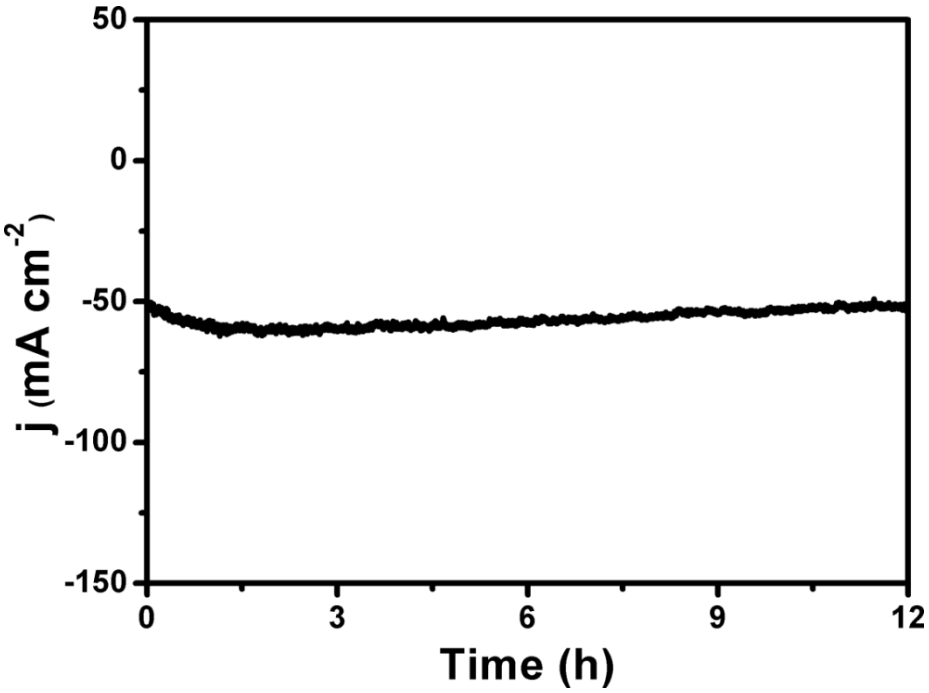

Fig. S9 The current-time curve of the CoP CPHs measured at an over potential of 200 mV in 0.5 M H_2SO_4.

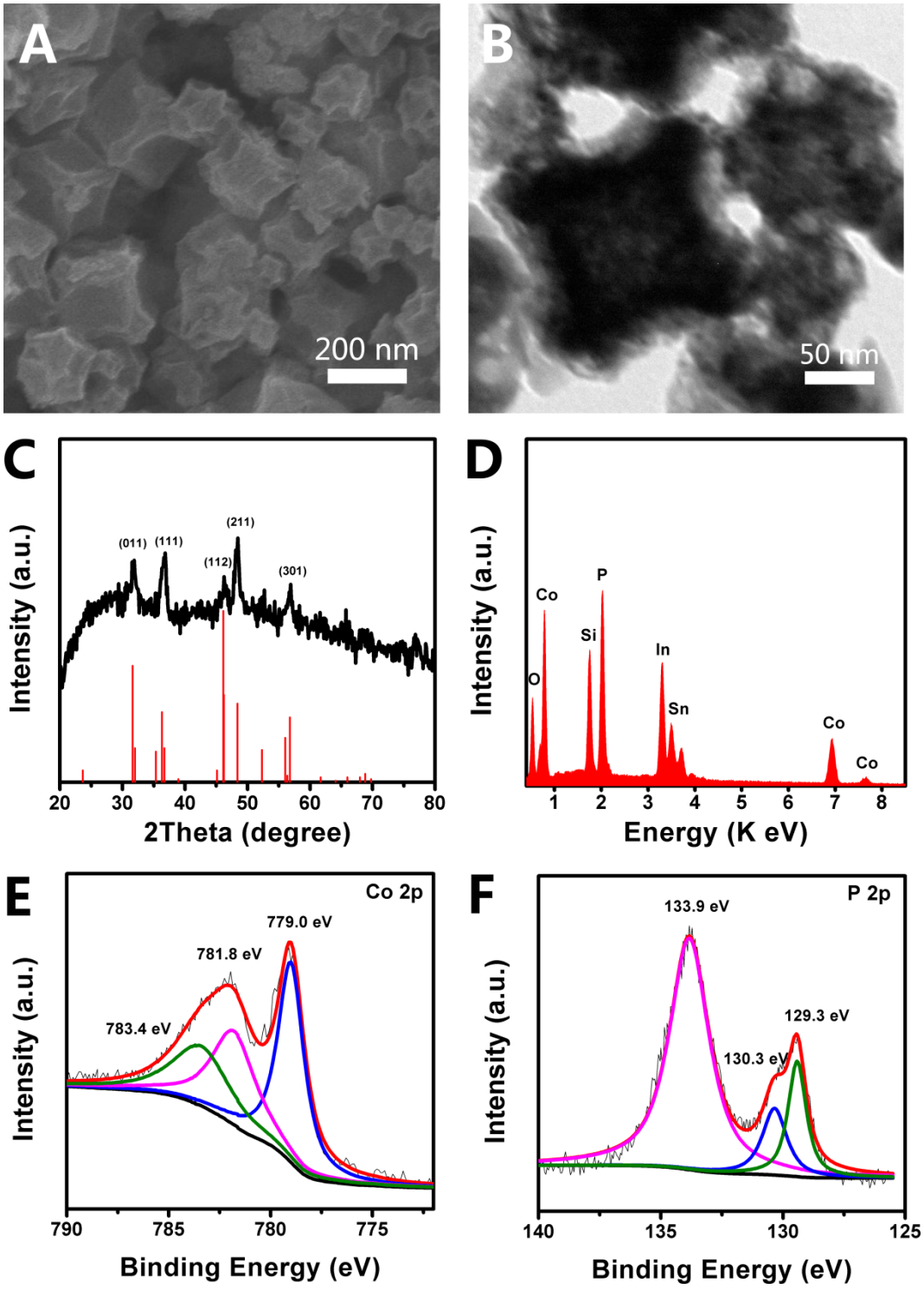

Fig. S10 SEM image (A), TEM image (B), XRD pattern (C), EDX pattern (D), high resolution Co (E) and P (F) XPS spectra of the recycling CoP CPHs after the stability test. The EDX pattern was obtained by dropping the sample on ITO.

Table S2 The element compositions of the as-prepared CoP CPHs before and after electrocatalysis from the EDX.

Element	before		after	
	Wt %	At %	Wt %	At %
Co	57.87	35.61	23.28	13.78
P	32.37	37.9	13.22	14.89
atomic ratio of Co and P	1 : 1.06		1 : 1.08	